
Space Weather Forecast

Issued on Saturday, 25 February 2023 at 13:26 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales <https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales>

Space Weather Forecast Headline: G1-G2 Minor to Moderate storms, and a chance G3 Strong Storms late day 2 or day 3 (26th/27th) due to CME arrival. R1-R2 Blackouts likely throughout, with a slight chance R3.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Moderate with 2 Moderate (R1) flares observed. The largest of these was associated with a filament eruption near to a small but complex sunspot in the northwest. This filament eruption is where a line of plasma from the Sun is released in a burst, in this case alongside a flare (although this is not always the case). A further brief Moderate flare was observed from a small sunspot group in the north-centre disc, however this region has been simplifying. The largest region is a relatively complex region in the northeast, although this has shown recent signs of simplification. The most complex and developing region is a small sunspot group in the south centre disc. There are a couple of further smaller and simpler regions giving seven total regions on the disc.

The filament eruption flare produced a coronal mass ejection (CME) which been assessed as likely arriving at Earth later on the 26th or early 27th, although the majority of the material of the CME appears to pass above Earth's orbit.

Solar Wind / Geomagnetic Activity: Solar winds showed a subtle and weak, but distinct signal from a likely glancing CME. This was visible a small and smooth rotation in the magnetic field profile, likely due to a passing but weak 'magnetic cloud'. Otherwise solar winds eased from being elevated due to a previous enhancement from the fast winds of a coronal hole to decline towards background levels with speeds declining 500 km/s to 400 km/s. The magnetic field strength was largely weak at below 6nT. The north-south component of the field however showed the smooth rotation from positive (northward) to negative (southward) values, although these remained at weak levels. Geomagnetic activity was Quiet (Kp 0-2).

Energetic Particles / Solar Radiation: The count rate of energetic particles increased due to the arrival of high energy protons from the Moderate flare and filament eruption. This peaked shortly after midnight, and remained below the S1 Minor Storm radiation level.

Four-Day Space Weather Forecast Summary

Solar Activity: Moderate activity is likely with further Moderate flares (R1-R2 Radio Blackouts). There is a slight chance of Strong flares, mainly due to the large sunspot in the northeast or the complex region in the south-centre.

Solar Wind / Geomagnetic Activity: A CME is expected to arrive at Earth on the evening of day 2 (26th) or early day 3 (27th). While the bulk of the material is likely to pass above the Earth, a more significant impact remains possible. This is likely to occur alongside a coronal hole fast wind enhancement, occurring earlier day 2 (26th). There is also the potential for some enhancement on day 1 (25th) due to CH78/- in the southwest disc. Ongoing CME and fast solar winds are then expected for much of day 3 (27th), before easing day 4 (28th). Mainly Quiet geomagnetic activity is expected to increase day 2 (26th) to Unsettled to Active with a chance of G1 Minor Storms due to any CH sourced enhancement. This then rising further to give a spell of

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G1/Minor to G2/Moderate Storms due to the CME arrival, with a chance of an isolated G3/Strong Storm interval. Should this occur, there is the potential for visible aurora across northern parts of the UK, including Scotland Northern Ireland, northern England and north Wales, given clear skies. Any CME effects are likely to ease later day 3 (27th) and into day 4 (28th) to become Quiet with isolated Unsettled interval

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) is expected to continue declining towards background levels, with a slight chance of increasing again due to any significant flares that occur. This giving a slight chance of S1/Minor Radiation Storms.

Geomagnetic Storms:

Geo-Magnetic Storm	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Minor or Moderate	G1 to G2	No	5	70	70	30
Strong	G3	No	1	30	30	1
Severe	G4	No	1	2	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	Yes	70	70	60	60
Very Active	R3 to R5 X	No	10	10	10	10

Solar Radiation Storms - (High Energy Protons):

Radiation Storms	Level (cm ⁻² sr ⁻¹ s ⁻¹)	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ S1	No	10	10	10	10
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = cm ⁻² sr ⁻¹ s ⁻¹)						